Governor's STEM Advisory Council
Regional STEM Network Hub
Application

April 5, 2012

Northwest Region

Iowa Lakes Community College

Name of proposed requesting entity (or entries as partners):
Iowa Lakes Community College

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Region:
Northwest

Proposed Location:
Iowa Lakes Community College will strategically locate Northwest Iowa's Regional STEM Hub offices on the college's Estherville and Spencer campuses. These campuses each present unique resources and benefits to the Regional STEM Hub, and the Regional STEM Advocate would divide their time between locations.

Iowa Lakes' Estherville campus is located near Highway 9, an east/west highway that will allow a Regional STEM Advocate quick and easy access to all communities in the northernmost part of the region. Estherville is home to Iowa Lakes' main campus, and STEM Hub offices at this location will provide the Regional STEM Advocate access to college administration. Furthermore, this campus is home to the college's key STEM programs such as Wind Energy and Turbine Technology, Computer Programming, Environmental Studies, and Sustainable Energy Resources Management. Estherville will also be the location of Iowa Lakes' Sustainable Energy Resources and Technology facility. This new facility will house programs in HVAC, solar energy, wind energy, biofuel, biomass, and geothermal energy.

Iowa Lakes' Estherville campus features a variety of large rooms for community and council meetings and science labs with high-tech equipment for faculty and student research. Science labs on this campus include a biology lab with specialized equipment for genetics research, a chemistry lab with specialized equipment for water quality research, an electrical systems lab that allows students to explore alternating and direct current electrical theory, and an environmental studies laboratory. In addition, students utilize Iowa Lakes' functional wind turbine and a non-functioning nacelle for wind energy research.

Iowa Lakes' Spencer campus is located on Highway 18, another east/west highway that will allow the Regional STEM Advocate access to all communities in the central and southern parts of the region. Spencer is a centrally-located commercial and population hub for the Northwest Iowa region, and the

location of the STEM Hub at this campus will allow STEM programs and activities a high level of visibility throughout the region. Iowa Lakes' Spencer campus features a state-of-the-art science lab that was completed in the summer of 2011. In addition, Iowa Lakes' Spencer campus also houses a surgical technology suite that was fully remodeled in the summer of 2011 to replicate a hospital surgical room.

The STEM Hub and Regional STEM Advocate office space on each campus will be prominently located in highly-trafficked areas. A large number of exceptional STEM educators teach and conduct research at both these campuses. STEM Hub offices will include technology such as desktop computers and phone lines. In addition, both campuses will be equipped with a new distance learning and telecommunications system in the fall of 2012. This technology was purchased through a Department of Agriculture RUS-DLT grant, and it is linked to technology at local high schools. This system offers worldwide connection to compatible technology systems, making it an ideal way for the Regional STEM Advocate to conduct regular face-to-face meetings with partners across the region without requiring extensive and time-consuming travel.

Identify Your Mission:
Iowa Lakes Community College's mission is "to provide opportunities for quality lifelong learning and promote economic development for our communities." The opportunity to house Northwest Iowa's Regional STEM Network Hub is an ideal expression of the college's mission in action. The development of regional STEM resources will allow Iowa Lakes to provide additional opportunities for quality lifelong learning by partnering with industries, businesses, and educational institutions throughout the Northwest Iowa region. It will also promote the economic development of local communities through a focus on STEM industry.

The college's commitment to STEM program development is evidenced by the recent successes of the college's National Science Foundation ATE (Advanced Technological Education) program and S-STEM (Scholarships for Science, Technology, Engineering, and Math) program. The college's ATE program, "Biotechnology Curriculum Development and Dissemination," provided funding for new curriculum for biotechnology-related courses and the purchase of cutting-edge scientific equipment. This equipment, including a liquid chromotograph, spectrophotometers, thermal cycler, incubation oven, vortexer, and microcentrifuge, allow for in-depth chemical, water quality, and genetics research on Iowa Lakes' Estherville campus. This program also funded annual staff development conferences for college faculty in biotechnology-related disciplines.

The college's S-STEM program, "Infinity Scholars," engaged 144 of Iowa Lakes' best and brightest STEM students over a period of four years. Fully 92% of program participants graduated with an associate's degree within two years, and the average participant GPA was 3.50. Two participants presented research at the annual meeting of the Iowa Academy of Science. Participants experienced a college visit, educational activities, and professional networking and career-exploration events as part of an annual trip to a large metropolitan area. Dr. Robert Klepper, the S-STEM program's Principal Investigator, presented program outcomes at the American Association of Community Colleges' first annual Broadening Impact Conference.

Iowa Lakes is continuously developing new and exciting STEM resources and programs for educators, students, and the community. In 2011, Iowa Lakes invested over $200,000 to install a state-of-the-art science lab on the college's Spencer campus. This lab is fully equipped for a wide range of scientific experimentation and instruction. In the summer of 2012, Iowa Lakes will host its first annual STEM Summer Camp for educators and secondary students. The student portion of the camp will include four

days of interactive learning sessions in STEM subjects taught by Iowa Lakes' STEM faculty. The educator portion of the camp will include the sharing of best practices and training in science and math teaching techniques. In addition to the new science lab in Spencer and a STEM Summer Camp for educators and students, STEM instructors at Iowa Lakes are collaborating with local homeschooling groups and families to develop a science equipment loan program.

As a Regional STEM Network Hub, Iowa Lakes will achieve the following goals through the development of a Regional STEM Advocate position and a Regional Advisory Council:

A. Develop, implement, maintain, and promote a seamless and collaborative communication system with other Iowa STEM regions for open and continuous sharing and development of resources, opportunities, and promising practices, especially those that span Regions.

B. Create and maintain a comprehensive catalog and asset map of STEM activities and resources within each Region that is shared and promoted.

C. Be the "voice" of and for STEM in all meetings and venues within a Region and convene region-wide dialogs to build awareness, interest, and shared beliefs in STEM-related activities and opportunities.

D. Foster the involvement of businesses in the region to help advance STEM education.

E. Inventory and lead discussions of regional gaps and needs and convene key groups and individuals to explore and develop initiatives to address those needs.

F. Develop and address Regional STEM Goals through comprehensive Statements of Work and Action Plans based on data and deliverables.

G. Report quarterly to the Governor's Advisory Council on activities and progress. An annual review will be required for renewal during and beyond an initial 3-year contract.

H. Measure and refine all STEM initiatives and goals regionally and contribute to a statewide STEM expansion process.

I. Oversee the implementation of programs at the community and regional level under direction from the Governor's STEM Advisory Council and account to that Council according to established guidelines.

Identify Support:
Iowa Lakes will support a Regional STEM Network Hub through the provision of office space, access to college data and resources, and 50% funding for a Regional STEM Advocate. The office space reserved for the Regional STEM Hub will be fully equipped with a desktop computer, email access, network access, and a telephone. If assigned a monetary value, the use of the Regional STEM Network Hub office space and equipment in the first year would amount to approximately $4,000.

Since the Regional STEM Advocate will need to communicate face-to-face with partners across the region and state on a regular basis, they will have access to Iowa Lakes' college vehicles and brand-new teleconferencing and distance learning system. This teleconferencing and distance learning system is part of a million-dollar project to equip Iowa Lakes and local high schools with tools for interconnectivity to promote higher learning. The Regional STEM Advocate will have access to Iowa Lakes' labs, faculty,

and staff, as well as to both four-year universities located on our campuses (Buena Vista University and Briar Cliff University).

Participating Organizations:
Iowa Lakes Community College maintains an extensive network of local and regional partners in education, business and industry, and workforce and community development. The college's strong relationships with these entities will allow for the expedient formation of a Regional Advisory Council representing all areas of Northwest Iowa.

Educational Partners
Iowa Lakes will incorporate a wide range of educational partners into the Regional Advisory Council. This includes area education agencies, nonprofit/informal learning centers, community colleges, K-12 students and parents, private colleges/universities, public universities, STEM teachers, and school board members. The Regional Advisory Council will also involve university extension offices. Specific potential partners in this category include:
- Prairie Lakes Area Education Agency
- Northwest Area Education Agency
- Friends of Iowa Lakeside Lab, Inc.
- Iowa Central Community College
- Western Iowa Tech Community College
- Northwest Iowa Community College
- Buena Vista University
- Briar Cliff University
- Iowa State University
- University of Northern Iowa
- University of Iowa
- Iowa State University Extension and Outreach (regions 1, 2, 5, 6, 7)

Business and Industry Partners
Business and industry representatives will also be key to the strength of Iowa Lakes' Regional Advisory Council. Iowa Lakes currently maintains a strong relationship with major businesses and industries in its five-county service area. The college will work through these and other partners to encourage participation by other STEM-related industries throughout the Northwest Iowa region. Specific potential partners in this category include:
- Eaton Corporation (Spencer)
- Polaris Industries Manufacturing, LLC (Spirit Lake)
- Poet Biorefining d/b/a Voyager Ethanol, LLC (Emmetsburg)
- Pure Fishing (Spirit Lake)
- TransOva Genetics (Sioux Center)
- Northwest Iowa Biotech (Sheldon)

Workforce and Community Development
Representatives from the region's economic development organizations, chambers of commerce, and workforce development agencies will provide the Regional Advisory Council with a perspective on the best ways to grow the region's economic prosperity through the development of STEM programs. Iowa Lakes' long history of successful collaboration with local and state workforce development organizations will provide a foundation for participation from additional economic development organizations in the region. Additionally, the inclusion of representatives from local governments and libraries will allow this

Regional Advisory Council to distribute resources and provide information to the communities of Northwest Iowa. Specific potential partners in this category include:
• Northwest Iowa Planning and Development Commission
• Iowa Lakes Corridor
• Iowa Workforce Development

Funding Assistance:
Iowa Lakes Community College will fund 50% of a Regional STEM Advocate position. This position will be supervised and directed through a cooperative effort between Iowa Lakes, the Northwest Iowa STEM Regional Council, and the Director of the Governor's STEM Advisory Council. In addition to assisting with the funding of this position, Iowa Lakes will also provide in-kind assistance to the Regional STEM Hub through activities focusing on data collection, economic development, academics, and institutional advancement. Iowa Lakes' STEM Advisory Committee will assist the Regional STEM Advocate with program development and academic activities. Institutional advancement activities will be enriched through the college's existing relationships with local and regional businesses and industries.

Meeting facilities and some marketing would also be made available for the Regional STEM Network Hub. Meetings may be held at any of Iowa Lakes' five campuses (Estherville, Spencer, Spirit Lake, Emmetsburg, and Algona) and may incorporate the college's new teleconferencing and distance learning technology. The college's marketing department may develop fliers, informational brochures, and media advertisements to supplement Hub resources.

Resource development for the Regional STEM Network Hub would enrich regular college activities. Iowa Lakes Community College is dedicated to the development of STEM programs and education, and serving as the Northwest Iowa Regional STEM Network Hub would be one way in which the college could achieve its institutional mission and goals for STEM.

Additional Information:
Iowa Lakes Community College's commitment to Northwest Iowa STEM is expressed through long-standing relationships with STEM industries, the development of highly successful and industry-validated renewable energy and technology programs, the nationally-recognized success of Iowa Lakes' National Science Foundation programs, the STEM Summer Camp for educators and students, the promotion of the college's STEM programs at the Clay County Fair, and the development of science kits for schools and home-schooled individuals. Iowa Lakes' STEM faculty and administrators have formed a STEM Advisory Committee for the exploration of program development and outreach. This committee is compiling information for the first edition of a digital STEM education newsletter that will be distributed through email and online.

Iowa Lakes' STEM programs and activities have been built on a strong foundation of exceptional and committed STEM faculty and staff, all of whom bring a unique and invaluable perspective to Iowa Lakes' programs:

• Dr. Ahmad Hemami (Ph.D. System Dynamics and Control) literally wrote the book on wind energy and turbine technology. His textbook, Wind Turbine Technology, was published by Cengage Learning, Inc. in 2011 and is widely used as a practical introduction to wind energy technology for technicians. Dr. Hemami is currently on sabbatical, but will return to Iowa Lakes to teach physics and electrical theory in the college's Wind Energy and Turbine Technology program. Throughout his experience in the industrial, academic, and research sectors, Dr. Hemami has gained expertise in automation, computer

programming and software design, robotics, simulation, control systems, computer-assisted design, optimization, and mechanical design.

• Dr. Robert Klepper (Ph.D. Physiology) has taught biology, botany, microbiology, organic and biochemistry, general chemistry, and organic chemistry at Iowa Lakes for 15 years. He has served as the Principal Investigator for Iowa Lakes' most recent National Science Foundation programs: the "Infinity Scholars" S-STEM program (2007-2011) and the "Biotechnology Curriculum Development and Dissemination" ATE program (2006-2010). Dr. Klepper has nine years' experience with liquid-liquid extraction, liquid column chromatography, and gas chromatography. He was central in the effort to purchase and install a high-performance liquid chromatograph, a Fourier transform infrared spectrophotometer, and a UV/Vis spectrophotometer for Iowa Lakes' chemistry lab on the Estherville campus. Dr. Klepper is an active member of many professional STEM organizations, and he presented the paper "Integration of Biotechnology into Chemical Curriculum at a 2-Year College" at the 2010 American Chemical Society Meeting. Dr. Klepper's success with Iowa Lakes' "Infinity Scholars" S-STEM was recognized by the American Association of Community Colleges through an invitational presentation of program outcomes at the Association's 2011 Broadening Impact Conference. His innovative approach to using technology in the classroom led to the presentation of "Digital Help Sessions to Enhance Chemistry Courses" at the League for Innovation in the Community College STEM-TECH Conference in October 2011. Dr. Klepper is currently involved in the development of new National Science Foundation S-STEM and ATE programs that will involve area high school students, teachers, Iowa Lakes' STEM faculty, and STEM industry representatives. He is also developing a new course for independent undergraduate STEM research at Iowa Lakes.

• Michelle Rubel (M.A. Mathematics w/Education Emphasis) taught math, algebra, geometry, physics, calculus, and statistics to secondary students for 10 years before joining Iowa Lakes' STEM faculty. Her secondary experience with schools in Northwest Iowa allows her a unique and in-depth understanding of regional secondary STEM education. She currently teaches Math for Liberal Arts, Statistics, and College Algebra and Trigonometry both in a classroom and through Iowa Lakes' distance learning system. She is also an active member of the college's STEM Advisory Committee.

• Mark Zabawa (M.S. Chemistry and M.S. Pharmacology and Molecular Sciences) is a dedicated cancer researcher who teaches chemistry, biology, microbiology, biotechnology, and human anatomy and physiology at Iowa Lakes Community College. He has recently served as Iowa Lakes' Education Association President and Vice President, and he was integral in the design and implementation of the new science lab at Iowa Lakes' Spencer campus. Mark is currently helping to design and implement Iowa Lakes' STEM Summer Camp educator and student curriculum. As part of the Meyers Research Group at Johns Hopkins University from 2007 to 2009, he conducted research into the design and synthesis of anti-cancer dual-action prodrugs utilizing a phosphoramidate delivery scaffold. He is currently a part of the Hosmane Group at Northern Illinois University. This group's research focuses on synthesizing cage-functionalized carbon nanotubes and fullerenes and evaluating them as potential agents for BNCT drug delivery. BNCT drugs have been shown to prolong the lifespan of patients with brain tumors. The development of an effective delivery method for this type of drug will provide hope for those diagnosed with brain tumors and open possibilities for future cancer-fighting research.

Subject Matter Expertise:
Iowa Lakes Community College possesses unique knowledge and experience in sustainable energy resources and technology. Iowa Lakes' faculty possess a wide range of industry, academic, and research experience related to sustainable energy, and this experience lends to a depth of understanding of the

issues and opportunities in this field. In the Wind Energy and Turbine Technology Program, Director Daniel Lutat possesses 28 years of Air Force aircraft maintenance experience, and Dr. Ahmad Hemami has published over 45 academic articles about wind and sustainable energy technology. Dr. Hemami is currently planning a more advanced textbook to follow his foundational Wind Turbine Technology textbook. Sustainable Energy Resource Management Professor Gary Phillips is actively involved in local and national conservation efforts and is a member of the National Parks Conservation Association, the National Wildlife Federation, and the Iowa Parks and Recreation Association.

Iowa Lakes launched the state's first educational wind energy training program in 2004 through financial support from the U.S. Department of Energy, the U.S. Department of Education, and industry partnerships. Beginning with a mere 15 students in the fall of 2004, the program has grown nearly tenfold to a total of 147 students in the spring of 2012. Program students experience the distinct advantage of having a 1.65 megawatt working turbine owned by the college to use as an educational laboratory. In 2011, the program was named as one of the first-ever recipients of the American Wind Energy Association's Seal of Approval.

In addition to the Wind Energy and Turbine Technology program, Iowa Lakes' Biorenewable Fuels Technology program and Sustainable Energy Resources Management program explore the wealth of energy resources available in the Midwest. The Biorenewable Fuels Technology program features instruction in the ethanol and biofuels production industry, and students gain experience in producing alternative fuels such as ethanol and soy diesel. Program expansion is planned to include instruction in fuels such as methane (biogas) and hydrogen. Students in the Sustainable Energy Resources Management program gain experience in wind energy and biomass energy resources.

Iowa Lakes is involved in planning for a new Sustainable Energy Resources and Technology training center to be housed on the college's Estherville campus. This new facility will encourage collaboration and innovation in the college's sustainable energy and technology programs by housing them collectively under one roof. With the completion of this space and the addition of cutting-edge technology and tools, Iowa Lakes' sustainable energy programs will be expanded to include solar and geothermal energy instruction. Students enrolled in sustainable energy resource and technology programs will first complete a common core before branching out into specialty subjects such as wind or solar energy. This new facility and approach to sustainable energy resource and technology training will prepare the next generation of highly-skilled technicians needed to achieve state and national energy goals.

Additional Considerations:
Please see "Additional Information".